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A Floodplains and Wetlands Assessment for the Potential Effects of the Decontamination and Demolition of the Omega West Reactor

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SUMMARY

Los Alamos Canyon within Los Alamos National Laboratory (LANL) boundaries is the location of the demolition and decontamination (D&D) of the Omega West Reactor (OWR). Floodplains and wetlands, as defined in 10 Code of Federal Regulations (CFR) 1022, are present in Los Alamos Canyon. Floodplain and wetland values for this area in Los Alamos Canyon were evaluated against the guidance in 10 CFR 1022, Executive Order (EO) 11990 (Protection of Wetlands), and EO 11988 (Floodplain Management). Issues associated with increases in stormwater flows from the project area into undeveloped canyon areas or from soil disturbance to undeveloped canyon bottoms are identified with respect to suggested mitigation for protecting floodplain and wetland values and preventing potential contaminant migration.

1.0 PROPOSED ACTION

The proposed OWR Project will result in the D&D of several structures and foundations in the bottom of Los Alamos Canyon. LANL proposes to D&D the OWR, a 24-ft-high (7.3-m) stainless steel cylinder with an 8-ft diameter surrounded by high-density concrete, and its associated structure, Building TA-2-1. In addition, there are three concrete slabs, one manhole, three small storage sheds, the boiler house, the blower house, the stack and all utility poles, light poles, fences, culverts, parking lots, debris catchers, bridges, rock catcher fences and trash. Decontamination of the Omega Facilities will be nonradiological and radiological. In some circumstances, the contamination could be mixed. The two-story, 17,761-ft^2 (1,650-m^2) building was constructed in 1943. The east end of the building was constructed of wood. The west end of the building was constructed of concrete blocks and houses the OWR. The exact methods by which the D&D will be accomplished have not yet been determined, but are likely to include the use of cranes, large trucks, impact drills, and saws to remove the concrete portions of the building.

After the Omega facilities are demolished, the streambed is proposed to be returned to its original condition. Depending on the levels of contamination found during the D&D activities, the core of the reactor could be removed in pieces after contamination is fixed; or the core could be capped and left until the contamination levels are acceptable for removal.

2.0 ENVIRONMENTAL BASELINE

2.1 Regional Description

2.1.1 Location within the State

LANL and the associated residential areas of Los Alamos and White Rock are located in Los Alamos County, north-central New Mexico, approximately 60 mi (100 km) north-northeast of Albuquerque and 25 mi (40 km) northwest of Santa Fe (Figure 1). The 28,654-acre (11,596-ha) LANL site is situated on the Pajarito Plateau. This plateau is a series of finger-like mesas separated by deep east-to-west-oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 7,800 ft (2,400 m) on the flanks of the Jemez Mountains to about 6,200 ft (1,900 m) at their eastern termination above the Rio Grande.

Most LANL and community developments are confined to mesa tops. The surrounding land is largely undeveloped. Large tracts of land north, west, and south of the LANL site are held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County. The Pueblo of San Ildefonso borders LANL to the east.

2.1.2 Geologic Setting

Most of the finger-like mesas in the Los Alamos area are formed from Bandelier Tuff, which is composed of ash fall, ash fall pumice, and rhyolite tuff. The tuff, ranging from nonwelded to welded, is more than 1,000 ft (300 m) thick in the western part of the plateau and thins to about 260 ft (80 m) eastward above the Rio Grande. It was deposited after major eruptions in the Jemez Mountains' volcanic center about 1.2 to 1.6 million years ago.

On the western part of the Pajarito Plateau, the Bandelier Tuff overlaps onto the Tschicoma Formation, which consists of older volcanics that form the Jemez Mountains. The tuff is underlain by the conglomerate of the Puye Formation in the central plateau and near the Rio Grande. Chino Mesa basalts interfinger with the conglomerate along the river. These formations overlay the sediments of the Santa Fe Group, which extend across the Rio Grande Valley and are more than 3,300 ft (1,000 m) thick. LANL is

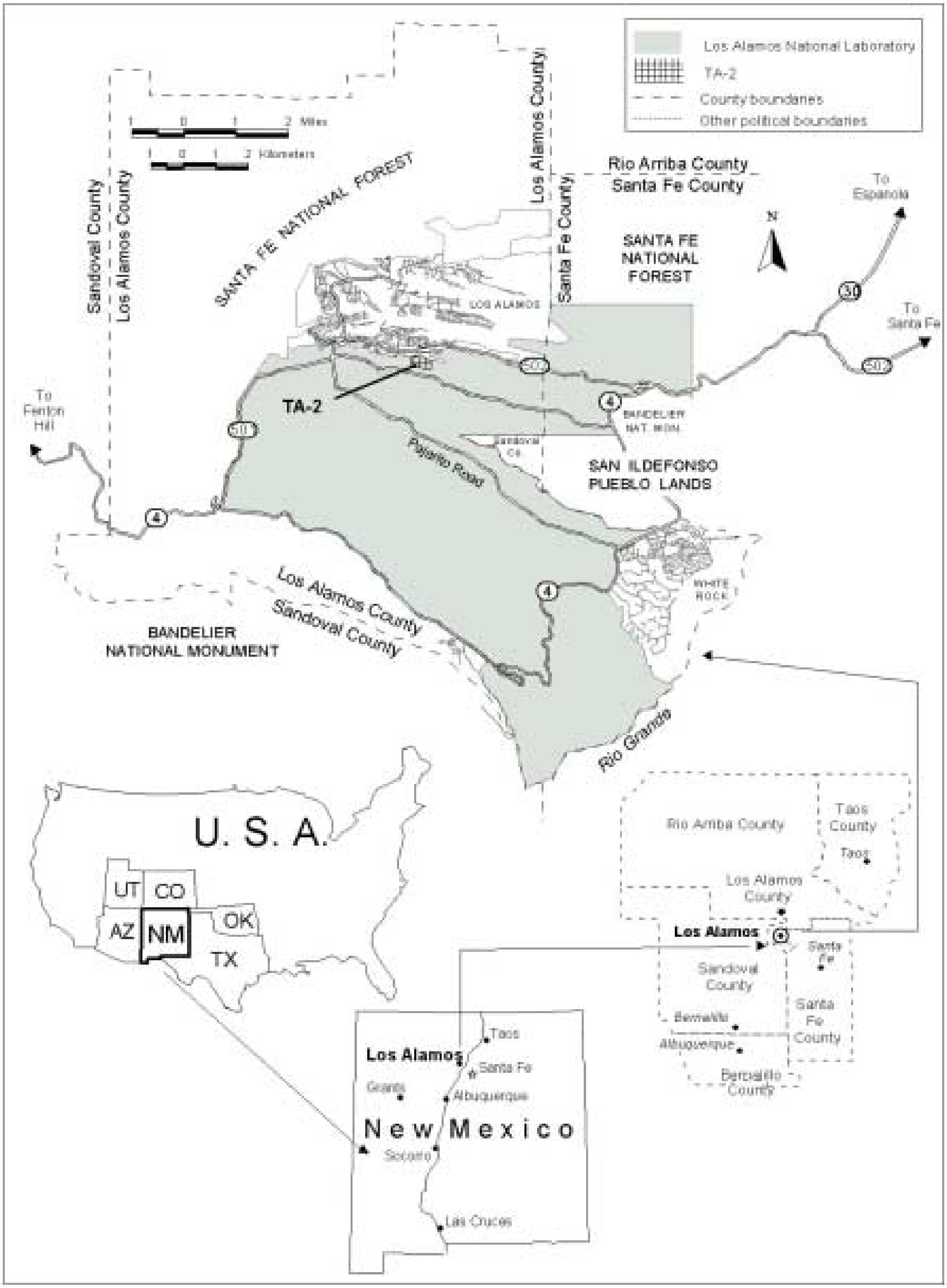

Figure 1. Location of Los Alamos National Laboratory.

bordered on the east by the Rio Grande, within the Rio Grande rift. Because the rift is slowly widening, the area experiences frequent minor seismic disturbances.

Surface water in the Los Alamos area occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the LANL site before they are depleted by evaporation, transpiration, and infiltration. Runoff from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year in some drainages. Effluents from sanitary sewage, industrial waste treatment plants, and cooling-tower blowdown enter some canyons at rates sufficient to maintain surface flows for varying distances.

Groundwater in the Los Alamos area occurs in three forms: (1) water in shallow alluvium in canyons, (2) perched water (a body of groundwater above a less permeable layer that is separated from the underlying main body of groundwater by an unsaturated zone), and (3) the main aquifer of the Los Alamos area. Ephemeral and interrupted streams have filled some parts of canyon bottoms with alluvium that ranges from less than 3 ft (1 m) to as much as 100 ft (30 m) in thickness. Runoff in canyon streams percolates through the alluvium until its downward movement is impeded by layers of weathered tuff and volcanic sediment that are less permeable than the alluvium. This process creates shallow bodies of perched groundwater that move downgradient within the alluvium. As water in the alluvium moves down the canyon, it is depleted by evapotranspiration and movement into underlying volcanics (Purtymun et al., 1977). The chemical quality of the perched alluvial groundwaters shows the effects of discharges from LANL.

In portions of Pueblo, Los Alamos, and Sandia canyons, perched groundwater occurs beneath the alluvium at intermediate depths within the lower part of the Bandelier Tuff and within the underlying conglomerates and basalts. Perched groundwater has been found at depths of about 120 ft (37 m) in the midreach of Pueblo Canyon to about 450 ft (137 m) in Sandia Canyon near the eastern boundary of LANL. This intermediate-depth perched water discharges at several springs in the area of Basalt Spring in Los Alamos Canyon. These intermediate-depth groundwaters are formed in part by recharge from the overlying perched alluvial groundwaters and show evidence of radioactive and inorganic contamination from LANL operations.

Perched water may also occur within the Bandelier Tuff in the western portion of LANL, just east of the Jemez Mountains. The source of this perched water might be infiltration from streams discharging from the mouths of canyons along the mountain front and underflow of recharge from the Jemez Mountains. Industrial discharges from LANL operations may also contribute to perched groundwater in the western portion of LANL. Perched groundwater in the Tschicoma Formation is the source of water supply for the ski area located just west of the LANL boundary in the Jemez Mountains.

The main aquifer of the Los Alamos area is the only aquifer in the area capable of serving as a municipal water supply. The surface of the aquifer rises westward from the Rio Grande within the Tesuque Formation (part of the Santa Fe Group) into the lower part of the Puye Formation beneath the central and western part of the plateau. Depth to the main aquifer is about 1,000 ft (300 m) beneath the mesa tops in the central part of the plateau. The main aquifer is separated from alluvial and perched waters by about 350 to 620 ft (110 to 190 m) of tuff and volcanic sediments with low (less than 10 percent) moisture content.

Water in the main aquifer is under artesian conditions under the eastern part of the Pajarito Plateau near the Rio Grande (Purtymun and Johnson 1974). The source of recharge to the aquifer is presently uncertain. Early research studies concluded that major recharge to the main aquifer is probably from the Jemez Mountains to the west because the piezometric surface slopes downward to the east, suggesting easterly groundwater flow beneath the Pajarito Plateau. However, the small amount of recharge available from the Jemez Mountains relative to water supply pumping quantities, along with differences in isotopic and trace element composition, appear to rule this out. Further, isotopic and chemical composition of some waters from wells near the Rio Grande suggest that the source of water underlying the eastern part of the Pajarito Plateau may be the Sangre de Cristo Mountains (Blake et al., 1995).

Groundwater flow along the Rio Grande rift from the north is another possible recharge source. The main aquifer discharges into the Rio Grande through springs in White Rock Canyon. The 11.5-mi (18.5-km) reach of the river in White Rock Canyon between Otowi Bridge and the mouth of Rito de los Frijoles receives an estimated 4,300 to 5,500 acre-ft (5.3 to 6.8 × 10^6 m^3) annually from the aquifer.

2.1.3 Topographic Setting

LANL and its surrounding environments encompass a wide range of environmental conditions. This is attributed in part to the prominent elevational gradient in the east-west direction. This is also attributable to the complex, local topography that is found throughout much of the region.

The spectacular scenery that is a trademark of the Los Alamos area is largely a result of the prominent elevational gradient of the region. The difference between its lowest elevation in the eastern extremities and its highest elevation on the western boundaries represents a change of approximately 5,146 vertical feet (1,568 m). At the lowest point along the Rio Grande, the elevation is approximately 5,350 ft (1,631 m) above mean sea level. At the opposite elevational extreme, the Sierra de los Valles, which is part of the more extensive Jemez Mountains, forms a continuous backdrop to the landscapes of the study region. The tallest mountain peaks in the Sierra include Pajarito Mountain at 10,441 ft (3,182 m), Cerro Rubio at 10,449 ft (3,185 m), and Caballo Mountain at 10,496 ft (3,199 m).

In addition to the prominent elevational gradient, the Los Alamos region is also topographically complex. Within Los Alamos County, there are three main physiographic systems (Nyhan et al., 1978). From east to west, these systems are the White Rock Canyon, the Pajarito Plateau, and the Sierra de los Valles. White Rock Canyon is 6,200 ft (1,890 m) above mean sea level. This rugged canyon is approximately 1 mi (1.6 km) wide and extends to a depth of nearly 900 ft (275 m). White Rock Canyon occupies about 5 percent of Los Alamos County. The Pajarito Plateau is the largest of the three physiographic systems, occupying nearly 65 percent of Los Alamos County. The Pajarito Plateau is a broad piedmont that slopes gently to the east and southeast. At a more localized scale, the Pajarito Plateau is also topographically complex. The surface of the plateau is dissected into narrow mesas by a series of east-west-trending canyons. Above 7,800 ft (2,377 m), the Sierra de los Valles rises to the western extremity of the study region. These mountains occupy approximately 30 percent of Los Alamos County.

The Sierra is also dissected into regularly spaced erosional features, although these canyons in the mountains are not so prominent as the canyons on the Pajarito Plateau.

2.1.4 Weather and Climate

Los Alamos has a temperate, semiarid mountain climate. However, its climate is strongly influenced by elevation, and large temperature and precipitation differences are observed in the area because of the topography.

Los Alamos has four distinct seasons. Winters are generally mild, but occasionally winter storms produce large amounts of snow and below-freezing temperatures. Spring is the windiest season of the year. Summer is the rainy season in Los Alamos, when afternoon thunderstorms and associated hail and lightning are common. Fall marks the end of the rainy season and a return to drier, cooler, and calmer weather. The climate statistics discussed below summarize analyses given in Bowen (1990 and 1992).

Several factors influence the temperature in Los Alamos. An elevation of 7,400 ft (2,256 m) helps to counter its southerly location, making for milder summers than nearby locations with lower elevations. The sloping nature of the Pajarito Plateau causes cold-air drainage, making the coolest air settle into the valley. The Sangre de Cristo Mountains to the east act as a barrier to arctic air masses affecting the central and eastern United States. The temperature does occasionally drop well below freezing, however. Another factor affecting the temperature in Los Alamos is the lack of moisture in the atmosphere. With less moisture, there is less cloud cover, which allows a significant amount of solar heating during the daytime and radiative cooling during the nighttime. This heating and cooling often causes a wide range of daily temperature.

Winter temperatures range from 30°F to 50°F (-1°C to 10°C) during the daytime to 15°F to 25°F (-9°C to -4°C) during the nighttime. The record low temperature recorded in Los Alamos (as of 1992) is -18°F (-28°C). Winter is usually not particularly windy, so extreme wind chills are uncommon at Los Alamos. Summer temperatures range from 70°F to 88°F (21°C to 31°C) during the daytime to 50°F to 59°F (10°C to 15°C) during the nighttime. Temperatures occasionally will break 90°F (32°C). The highest temperature ever recorded (as of 1992) in Los Alamos is 95°F (35°C).

The average annual precipitation in Los Alamos is 18.73 in. (47.57 cm). The average snowfall for a year is 58.9 in. (149.6 cm). Freezing rain and sleet are rare at Los Alamos. Winter precipitation in Los Alamos is often caused by storms entering the United States from the Pacific Ocean, or by cyclones forming or intensifying in the lee of the Rocky Mountains. When these storms cause upslope flow over Los Alamos, large snowfalls can occur. The snow is usually a dry, fluffy powder with an average equivalent water-to-snowfall ratio of 1:20.

The summer rainy season accounts for 48 percent of the annual precipitation. During the July–September period, orographic thunderstorms form when moist air from the Gulf of Mexico and the Pacific Ocean moves up the sides of the Jemez Mountains. These thunderstorms can bring large downpours, but sometimes they only cause strong winds and lightning. Hail frequently occurs from these rainy-season thunderstorms.

Winds in Los Alamos are also affected by the complex topography, particularly in the absence of a large-scale disturbance. There is often a distinct daily cycle of the winds around Los Alamos. During the daytime, upslope flow can produce a southeasterly wind on the plateau. In the evening, as the mountain slopes and plateau cool, the flow moves downslope, causing light westerly and northwesterly flow. Cyclones moving through the area disturb and override the cycle. Flow within the canyons of the Pajarito Plateau can be quite varied and complex.

2.1.5 Plant Communities

The Pajarito Plateau, including the Los Alamos area, is biologically diverse. This diversity of ecosystems is due partly to the dramatic 5,000-ft (1,500-m) elevation gradient from the Rio Grande on the east to the Jemez Mountains 12 mi (20 km) to the west, and partly to the many steep canyons that dissect the area. Five major vegetative cover types are found in Los Alamos County: juniper (*Juniperus monosperma* [Engelm.] Sarg.)-savanna, piñon (*Pinus edulis* Engelm.)-juniper, ponderosa pine (*Pinus ponderosa* P. & C. Lawson), mixed conifer, and spruce-fir. The juniper-savanna community is found along the Rio Grande on the eastern border of the plateau and extends upward on the south-facing sides of canyons at elevations between 5,600 to 6,200 ft (1,700 to 1,900 m). The piñon-juniper cover type, generally in the 6,200- to 6,900-ft (1,900- to 2,100-m) elevation range, covers large portions of the mesa tops and north-facing slopes at the lower elevations. Ponderosa pines are found in the western portion of the plateau in the 6,900- to 7,500-ft (2,100- to 2,300-m) elevation range. These three cover types predominate, each occupying roughly one-third of the LANL site. The mixed conifer cover type, at an elevation of 7,500 to 9,500 ft (2,300 to 2,900 m), overlaps the ponderosa pine community in the deeper canyons and on north-facing slopes and extends from the higher mesas onto the slopes of the Jemez Mountains. Spruce-fir is at higher elevations of 9,500 to 10,500 ft (2,900 to 3,200 m). Twenty-seven wetlands and several riparian areas enrich the diversity of plants and animals found on LANL lands.

2.1.6 Post-fire Plant Communities

In May 2000, the Cerro Grande Fire burned over 43,000 ac (17,200 ha) of forest on and around LANL. Most of the habitat damage occurred on Forest Service property to the west and north of LANL. An assessment of fire-induced vegetation mortality was made by the Burned Area Emergency Rehabilitation Team (BAER 2000) and is discussed for threatened and endangered species in the Wildfire Hazard Reduction Plan Biological Assessment (Haarmann and Loftin 2001). Some vegetation was burned in floodplains, but not in wetlands.

2.1.7 Pre- and Post-fire Hydrology

McLin (1992) modeled all major 100-year floodplains for LANL using US Army Corps of Engineers Hydrologic Engineering Center HEC-1 and HEC-2 computer based models. These data represent pre-fire flow rates for all of the floodplains on LANL. Post-fire maps and modeling are being created and will be completed by September 2001 (McLin, pers. comm.). However, an estimate of the flows for every canyon post-fire is roughly a magnitude of ten greater than the pre-fire model data (McLin, pers. comm.). Best available information estimates the post-fire 100-year, 6-hour flood event to cover the canyon bottom at least one foot high, canyon wall to canyon wall.

3.0 PROJECT DESCRIPTION

3.1 Goals and Objectives of the OWR D&D Plan

The overall goals of the OWR D&D are to

1) protect the public, LANL workers, facilities, and the environment from contamination and flood debris,

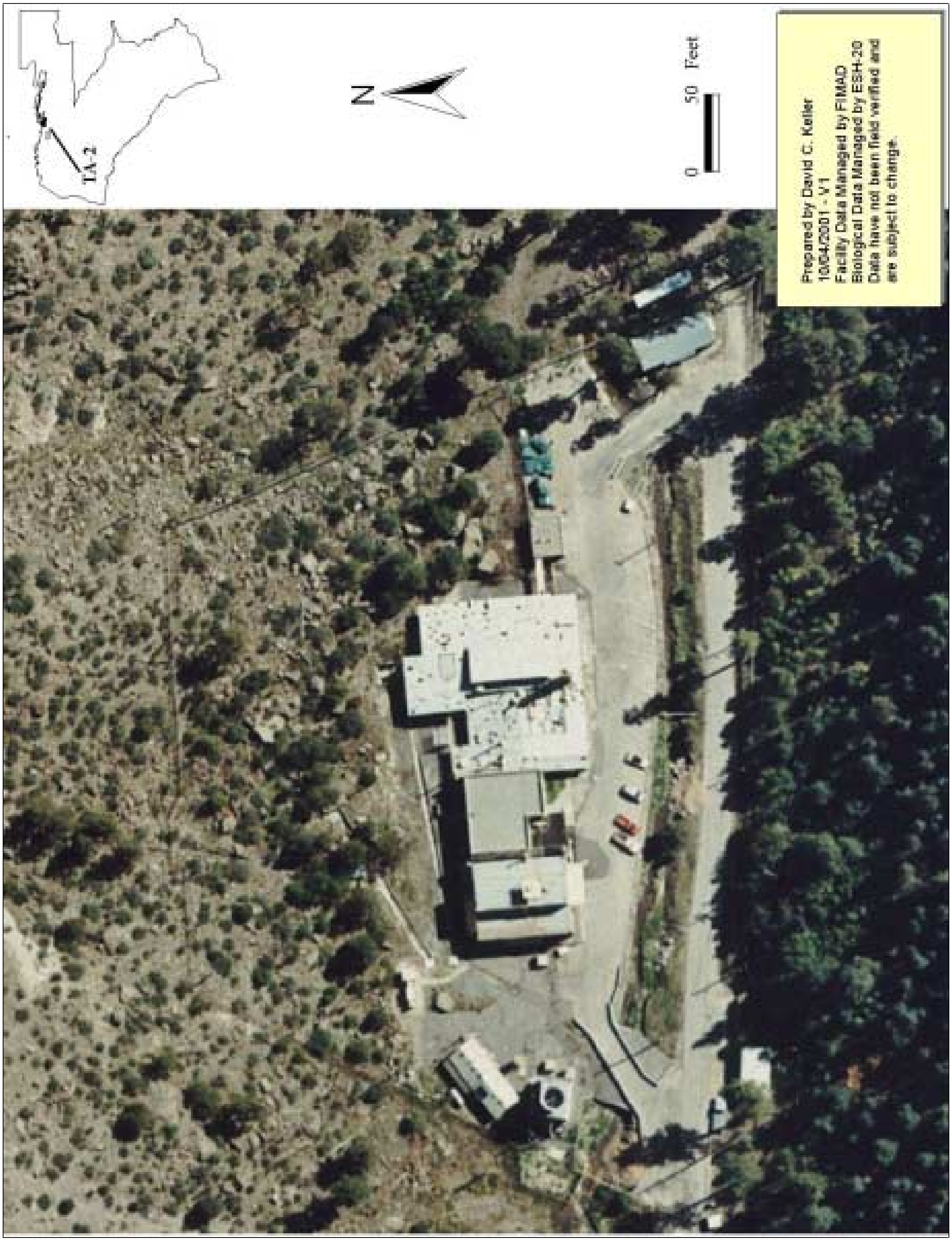

Figure 2. Omega West Reactor D&D Project Area

2) minimize impacts to cultural and natural resources while conducting a clean up of the OWR location, and
3) improve forest health and wildlife habitat through decreasing the likelihood of contaminant release.

The above goals will be accomplished through the following specific objectives:

1) Fix or remove sources of contamination at the OWR.
2) Remove a majority, if not all, of the structures of the OWR so that the debris can not be transported down the canyon in a flood event.
3) Limit the environmental impacts of the D&D as much as possible during the clean up.

3.2 End-State Conditions

The return of the OWR location to near preoccupation conditions and the removal of as much contamination as possible are the desired results of this project.

4.0 DESCRIPTION AND EFFECTS ON FLOODPLAINS AND WETLANDS

Pursuant to EO 11988, Floodplain Management, each federal agency is required, when conducting activities in a floodplain, to take actions to reduce the risk of flood damage; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Title 10 CFR Part 1022.4 defines a flood or flooding as "…a temporary condition of partial or complete inundation of normally dry land areas from....the unusual and rapid accumulation of runoff of surface waters..." Title 10 CFR Part 1022.4 identifies floodplains that must be considered in a floodplain assessment as the base floodplain and the critical-action floodplain. The base floodplain is the area inundated by a flood having a 1.0 percent chance of occurrence in any given year (referred to as the 100-year floodplain). The critical-action floodplain is the area inundated by a flood having a 0.2 percent chance of occurrence in any given year (referred to as the 500-year floodplain). Critical action is defined as any activity for which even a slight chance of flooding would be too great. Such actions could include the storage of highly volatile, toxic, or water-reactive materials.

Pursuant to EO 11990, Protection of Wetlands, each federal agency is to avoid, to the extent practicable, the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands if a practicable alternative exists. DOE 10 CFR Section 1022.4(v) states "Wetlands means those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflow, mudflats, and natural ponds."

According to 10 CFR 1022.12(a)(2), a floodplain/wetland assessment is required to discuss the positive and negative, direct and indirect, and long- and short-term effects of the proposed action on the floodplain and/or wetlands. In addition, the effects on lives and property and on natural and beneficial values of floodplains must be evaluated. For actions taken in wetlands, the assessment should evaluate the effects of the proposed action on the survival, quality, and natural and beneficial values of the wetlands. If the US Department of Energy (DOE) finds no practicable alternative to locating activities in floodplains or wetlands, DOE will design or modify its actions to minimize potential harm to or in the floodplains and wetlands. The floodplains and wetlands that are assessed herein are those areas in canyons or drainages that are seasonally inundated with perennial or intermittent streams from runoff during 100-year floods.

4.1 General

Wetland functions are naturally occurring characteristics of wetlands such as food web production; general, nesting, resting, or spawning habitat; sediment retention; erosion prevention; flood and runoff storage; retention and future release; groundwater discharge, or recharge; land nutrient retention and removal. Wetland values are ascribed by society based on perception of significance and include water quality improvement, aesthetic or scenic value, experiential value, and educational or training value. These values often reflect concerns regarding economic values; strategic locations; and in arid regions, location relative to other landscape features. Thus, two wetlands with similar size and shape could serve the same function but have different values to society. For example, a wetland that retains or changes flood flow timing of a flood high in the mountains might not be considered as valuable as one of similar size that retains or changes flood flow timing of a flood near a developed community. Wetlands were addressed in the LANL Site-Wide Environmental Impact Statement as follows (DOE 1999):

> "Wetlands in the general LANL region provide habitat for reptiles, amphibians, and invertebrates and potentially contribute to the overall habitat requirements of the peregrine falcon, Mexican spotted owl, southwestern willow flycatcher, and spotted bat. Wetlands also provide habitat, food, and water for many common species such as deer, elk, small mammals, and many migratory birds and bats. The majority of the wetlands in the LANL region are associated with canyon stream channels or are present on mountains or mesas as isolated meadows containing ponds or marshes, often in association with springs."

Presence or absence of floodplains and wetlands in the project area of Los Alamos Canyon have been assessed using Flood Hazard Boundary Maps for Los Alamos County (DHUD 1987), geographic information system (GIS) data sets, including the National Wetlands Inventory from the US Fish and Wildlife Service (USFWS), University of California (UC) internal data sets, on-site surveys, and previously developed floodplain modeling (McLin 1992). Proposed uses for each of the canyons being evaluated for the OWR Project are discussed, and specific information on floodplains, tract wetlands, and adjoining or nearby wetlands is provided.

Locations of floodplains and wetlands associated with, or close to, the proposed OWR Project appear below. McLin (1992) modeled all major 100-year floodplains for LANL using US Army Corps of Engineers Hydrologic Engineering Center HEC-1 and HEC-2 computer based models. Figure 3 represents those floodplains in the project area of LANL. Wetlands within LANL have been broadly mapped by the USFWS. This information is available in the National Wetlands Inventory (NWI) in a GIS-based format. This hierarchical system follows Cowardin et al. (1979), and is based entirely on aerial photography. Small wetlands, or those in steep canyons, may not be detected using this method. Additional on-site surveys and internal UC databases were also used to gather information regarding these resources. The direct and indirect (both primary and

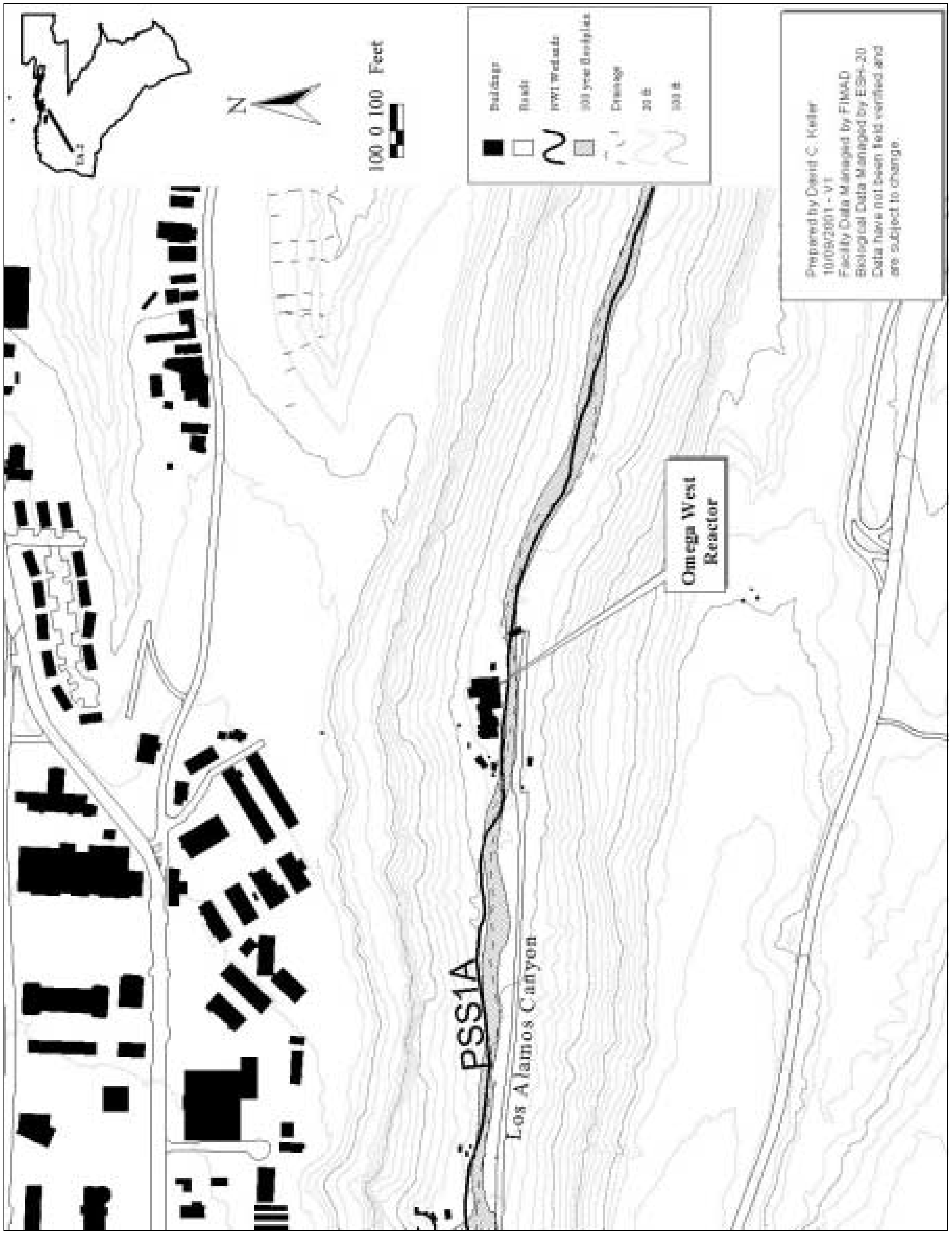

Figure 3. Location of floodplain and wetlands in the project area.

secondary) effects of the OWR D&D on floodplain and wetlands resources located in the Los Alamos Canyon project area are discussed below. Effect of proposed floodplain actions on lives and property and on natural and beneficial floodplain values is evaluated. Clean Water Act 404 permit process requirements would limit development in wetlands without regulatory review and consensus from the Corps of Engineers.

4.2 Canyon Area Issues and Concerns

Los Alamos Canyon on LANL land is comprised primarily of mixed conifer and ponderosa pine. This canyon has been identified as core habitat for the Mexican spotted owl. Guidelines are being established in the concurrent Biological Assessment. Until the Biological Assessment, which is law-binding, is approved by the USFWS no activities should occur in this area.

This document will evaluate concerns of potential increased stormwater flows down canyon into undeveloped canyon. These concerns include a potential for impacts to floodplain and wetland values and contaminant-plume movement. Potential effects are based on areas of impervious surface during and following the D&D.

5.0 LOS ALAMOS CANYON PROJECT AREA FOR FLOODPLAINS AND WETLANDS

5.1 Description

Los Alamos Canyon is predominantly comprised of mixed conifer forest on the north-facing slope and ponderosa pine and piñon juniper on the south-facing slope. There is an ephemeral stream in the bottom of the canyon within the proposed D&D site (see Figure 3). There are wetlands of a riverine and temporarily flooded type along the edges of the stream. The wetlands fit the National Wetland Inventory classification of palustrine, shrub-scrub, broadleaf deciduous, and temporarily flooded (PSS1A). The Los Alamos Canyon weir was created during mitigation measures for the CGF. Hydrophytes, particularly cattails, are present and vegetation in general is growing well, even on ash deposits. This wetland is a site both impacted by and created because of the CGF. It will be important to monitor its progress as time goes on for the speed of its development and for its ability to act as a contaminant and ash sponge.

The 100-year floodplain covers the entire canyon bottom. There was little or no fire damage from the Cerro Grande Fire in the project area; however, the majority of the upper watershed to the west of the project area suffered 100% vegetation mortality. There is an established road the length of the canyon, which is paved to the west of the site and dirt to the east of the site.

5.2 Floodplains and Wetlands Impacts from Proposed OWR D&D

Floodplains

The 100-year floodplain as described for the purpose of this project covers the length and breadth of the canyon bottom.

Wetlands

There are wetlands associated with this canyon.

Summary of Impacts

No potential for loss of life or property has been identified with respect to floodplains or wetlands in this canyon, as long as previously approved best management practices are considered for the OWR site. A possible direct effect of the OWR Project is the increase of erosion and storm water runoff. These effects are difficult to predict in a 100-year flood event based on current information.

Work conducted in Los Alamos Canyon may contribute to increased sediment movement, and there may be some retention of those sediments by the wetlands, particularly the wetland forming at the weir. Mitigation should be installed to minimize these impacts.

Secondary indirect impacts (outside of the project area) resulting from the OWR Project could result in possible impacts to floodplains and wetlands not associated with the project area (e.g., downstream to the Rio). Off-site floodplain values potentially impacted by the project include alteration of flood flow retention times, redistribution of sediments, and stream channel migration. Mitigation could be installed to minimize these impacts.

Off-site wetland values potentially impacted by the OWR Project include alteration of downstream food production, nesting, foraging, or resting habitat; sediment retention time changes; and loss of experimental or educational opportunities. These secondary indirect impacts are anticipated to come from both changes in timing of stormwater runoff and increases in stormwater from exposed soils. Mitigation could be installed to minimize these impacts.

At a minimum, best management practices for runoff control, such as silt barriers and stormwater retention ponds, should be in place to mitigate runoff effects during the D&D process. These best management practices should incorporate considerations of the National Pollutant Discharge Elimination System permit program and Environmental Protection Agency requirements for a Stormwater Pollution Prevention Plan.

5.3 General Mitigation for the OWR D&D

In all cases, best management practices should be followed as per the OWR Biological Assessment (in review), the Special Environmental Analysis (DOE 2000) related to the Cerro Grande Fire, and any and all DOE and LANL best management practices for wetlands and floodplains.

All work conducted for the proposed OWR Project that involves the disturbance of soils through road building, continuous use of roads, off road vehicle use, and dragging of debris, potentially contributes to an increase in sediment movement during a 100-year storm event. This in turn can possibly increase the amount of contaminants being removed to downstream areas, particularly if soils are disturbed in canyons. Mitigation actions associated with activities in floodplains will in part depend upon best management practices already in place for potential release sites, erosion control, and post-project mitigation found in the OWR Biological Assessment and the Cerro Grande Fire Special Environmental Analysis Mitigation Plan.

In general, no debris should be left in the floodplains (e.g., canyon wall to canyon wall). This includes all debris and D&D material. Leaving debris of any kind in a drainage, stream channel, or water course, even if it only runs seasonally, may invoke a penalty under Sections 401 and/or 404 of the Clean Water Act. Be sure enough trees and other vegetation remain along channel edges to stabilize the banks.

Best management practices should be employed when working in canyon bottoms since the entire area is considered potentially contaminated. Minimizing soil disturbance and contaminant movement is desired. Following the already prescribed method of using established roads only in canyon bottoms will help with this issue.

In addition, there are mitigation measures employed by US Forest Service that aid in the prevention of increased erosion, contaminant movement, and stormwater runoff that should be considered. These suggestions are for all canyon areas, since the increase in potential erosion and movement of sedimentation into the floodplains increases with soil disturbing activities. These methods include decreasing the compounding effects of vehicle use and removal of debris. Reducing the amount of areas of bare soil simultaneously is optimal at any time of year, but particularly during the monsoon months (late June-early September). Los Alamos Canyon has severely burned headlands and may be sensitive to sedimentation during the monsoon season in particular.

5.4 Los Alamos Canyon Additional Best Management Practices

General mitigation requirements to limit erosion and preserve habitat are as follows.

- Soils should not be removed during heavy rains or when the reservoir will need to be drained.
- Soils should not be stored or stockpiled in the bottom of Los Alamos Canyon.
- Soil disturbance should be kept to an absolute minimum.
- Best management practices should be strictly adhered to and maintained. Storm water leaving the site must be near normal in rate of flow and sediment content.
- All activity areas must be bermed to prevent storm events from reaching the stream channel.

Wetlands:

- The vegetation along the stream channel should be preserved as much as possible.
- Work must not be done along the stream channel with heavy equipment while the soil is wet.
- Off road activities must be restricted as much as possible and not used when an existing road is available.
- All soils along the stream channel must be re-vegetated with native species as soon as possible, including during downtime in D&D activity.
- Any areas of wetland or soft soils must be crossed on large sheets of plywood or other such material to distribute the weight of machinery and limit soil disturbance.

Floodplains:

- There can be no storage of equipment or loose materials in the floodplain.
- There can be no vehicle maintenance or fueling with in 100 ft (30 m) of the stream channel.
- All vehicles must be in good working condition and not leaking fluids.
- All the dust produced during activities must be suppressed and not allowed to settle in the floodplain where they may be swept down stream.
- All debris must be cleaned soon after development, especially during monsoon season.

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